

vowel *ē* very clearly. At half revolution per second, *ou*, *au*, were distinctly heard.

2. The vowel *ō* was sung while the cylinder rotated at different rates of speed. On reproducing the sounds, the cylinder being revolved more slowly than at first, the vowel *au* was heard, changing to *ō*, *ē*, *ē*, falling to *ē* again as the velocity was slackened a little.

3. The vowel *ā* was spoken while the cylinder made one revolution per second. On reproducing the sound, the rate being half a revolution per second, *au* was heard, changing to *ā* when the rate increased to one revolution, and at three revolutions per second *ā* was heard.

4. The vowel *ō* was spoken several times in succession, the rate of the cylinder being gradually accelerated. On reproducing the sound by a uniform and slow rotation, *au* and *ou* were heard; on rotating faster, *ē* and *ī*.

Several other experiments were tried in the short time during which the instrument was at our service, all of which were strikingly confirmatory of Helmholtz's theory. Difficulty was experienced in reproducing the highest vowels *ē*, *ī*, probably on account of want of readiness of response in the disc. The bell of a reed-pipe was placed over the mouth-piece of the instrument when the sound was to be reproduced, for which a horn of pasteboard was substituted in some of the trials.

We hope to render these experiments more rigorously quantitative, as the phonograph promises to be a valuable aid to research in this field. Very probably others may have worked with the same end in view, and if so it would be interesting to learn what has been their experience.

CHAS. R. CROSS

Boston, U.S., April 29

The Telephone

WITH reference to the letter of Lieut. Savage which appeared in your last impression (p. 77) respecting the telephone, this gentleman has noticed that on removing the ferrotype disc of the sending instrument and tapping the magnet with a diamagnetic body, such as a piece of copper, the taps are distinctly heard at the receiving end. I have repeated this experiment. Not only can a diamagnetic substance be used for tapping, but the magnet may be removed altogether and a bar of soft iron substituted without causing any material difference in the results, and this bar of soft iron may be placed at right-angles to the line of dip. The vibrations of a tuning-fork are transmitted very distinctly. When held in the line of dip the results obtained are more marked. Taps and the tuning-fork vibrations are readily heard, and by covering with the ferrotype disc a conversation was actually carried on through this bar of soft iron. There is perhaps nothing very surprising in obtaining these phenomena with the bar in the "dip" line, but when the same bar of perfectly soft and recently annealed iron can be held in any position in a plane at right-angles to that line and used as a sender for powerful vibrations, such as those of a tuning-fork or the taps of a diamagnetic body on the naked end of the bar, we cannot but be struck by the surprising delicacy of the telephone as a test for the earth's magnetism.

The receiving instrument used in the above experiments was an ordinary bell telephone $2\frac{1}{2}$ in. disc '007 of an inch in thickness.

9, St. John's Road, Bristol, May 18 ALFRED CHIDDEY

Hereditary Transmission

IN 1837, Capt. D'Urban of H.M.S. *Griffin*, having captured, off the south coast of Martinique, a Portuguese slaver, called the *Don Francisco*, landed in this colony the living freight of 437 human beings, who, about two months previously, had been forced from their homes on the banks of the Congo, to be sold in Cuba.

William Laidlaw, one of the liberated slaves, who is now in a position of some trust on the Goodwill sugar plantation in the island, gives to me the following interesting details of hereditary transmission in the African, which I believe will be interesting to the readers of NATURE.

"I am about sixty or sixty-five years of age, and was born with six fingers on each hand. Soon after 'my freedom' I married a woman from 'our country.' We had four children, two being boys and two girls; they were born with six fingers on each hand, and one of the girls had six toes on each foot.

"My eldest son Robert, who is married and settled in Demerara, is the father of two boys, who have six fingers on

each hand. My second son, William, who is working with me on the Goodwill estate, married, and his wife had five children; they were born having the same peculiarity; but I regret to say none are living."

I yesterday sent for William Laidlaw, and have substantiated his father's statements. I measured the sixth fingers: the one on the right hand is exactly $1\frac{1}{4}$ inch in length, and has a perfectly formed nail, the one on the left showed traces of having been partially amputated.

EDMUND WATT

Resident District Magistrate

Dominica, British West Indies, April 27

What is a "Water-shed"?

SOME time ago the term "water-shed" was somewhat vaguely used to imply either the dividing ridge between two river basins or the slopes down which the water poured into the rivers themselves. Latterly, if I mistake not, it has generally been used by geographers in the former sense only. Mr. George Grove, F.R.G.S., however, in his excellent little Primer on Geography, uses the term "water-parting" for the ridge, and water-shed for the whole of the ground between the water-parting and the stream;—very clearly illustrating his meaning by reference to the ridge tiles and the slope of the roof of a house respectively.

There may be some reason, especially in a work of the kind, for substituting "water-parting" for "water-shed," in the sense first quoted, but is the use of the latter, to indicate the flow of water down the slopes, justified either by etymology, or even by the correct use of the word "shed" in ordinary conversation?

The derivation from Anglo-Saxon *scēd-an* or *scēad-an*, indicates the primary meaning to divide or sever. It is also used metaphorically in some of the north-country dialects, as "there is no shed (difference) between us." No doubt, by a very natural ellipsis it often implies flowing or falling. A woman sheds tears, or a tree sheds its leaves, and the consequent flowing down the cheeks, or fluttering down to the ground need not be specially expressed. But in this case the word is used distinctively, and should surely be used, if used at all, in its stricter and primary sense, while the fall or flow of water can be appropriately distinguished.

Of course this is merely a question of terminology, but I think it is one worth noticing if only for the sake of the youthful millions who are being brought to some knowledge of elementary geography, and will hardly be helped to appreciate the exactness of science if they find the same word is used by different authorities to describe things so different as the dividing ridge and the hill slopes of the land they live in.

R. H.

Savile Club, Savile Row, W.

Abnormal Coccyx

IN NATURE for September 21, 1876, I gave an account of a peculiar abnormality in a girl aged eight, in whom the coccyx was turned backwards and upwards, and a little above it there was a circular depression in the skin, about $\frac{1}{4}$ inch in diameter, and about $\frac{1}{4}$ inch deep. On being dragged downwards the skin in this hollow became everted and formed a covering to the point of the coccyx. Shortly afterwards I had an opportunity of examining the other children of the family, with the following results:—

Boy aged six, normal.

Girl aged four, depression in the same spot as in the eldest sister, coccyx normal.

Girl aged two, normal.

Boy aged seven months, fairly deep hole (not measured) in same position, coccyx less curved forward than usual.

The parents were said not to possess this peculiarity; I could get no information as to the other members of the family.

A few days ago I met with another case of the same kind in a boy eight months old. The coccyx was curved sharply backwards, and there was a circular depression in the skin, about 5 mm. in diameter, a little higher up than in the other cases, which was easily raised to the level of the surrounding parts, and effaced by a little traction.

ANDREW DUNLOP

Jersey

Lecture Experiment

A glass flask of about a litre capacity is partially filled with water and closed with a cork, through which a tube passes

which terminates flush with the lower side of the cork. Above, the tube is bent twice at right angles, the other extremity of the tube dipping below the surface of water of ordinary temperature.

The water of the flask is now boiled, and as soon as the air has been driven from the flask remove the flame and allow the water of the vessel to recede into the flask. At the first entry of the cool water the steam will be so greatly condensed that a brisk ebullition will take place, which for a few seconds checks the inflow of the water, driving it down the tube; further cooling quickly causes more water to enter, when the same phenomenon is repeated. After two or three oscillations of this kind the water runs continuously, and with great velocity, into the flask, which should not be allowed to fill, as it is in that case usually broken by the shock, which terminates the experiment.

FRANCIS E. NIPHER

St. Louis, April 12

Sound-emitting Crustaceans

IN an article in NATURE, vol. xviii, p. 53, you say: "Everybody who had searched for animals on coral-reefs, or had dredged in tropical seas, was familiar with the 'clicking' sounds emitted by the *Alpheï* and their allies."

Those who wish to hear this sound need not go to coral reefs, or tropical seas—as the shores of Guernsey, Herm, or the other Channel Islands, produce *Alpheus ruber* and other *Alpheï* in abundance.

Keeping them as I do in aquaria, it is startling sometimes in the evening to hear the loud snap, produced by sharply striking together the two claws on the larger leg.

May 10

H. STUART WORTLEY

GEOGRAPHICAL NOTES

AFTER the suppression of the Mahometan rebellion in the Chinese province of Yunnan, a number of the so-called Panthays took refuge in British Burmah to avoid the indiscriminate cruelty of their conquerors; but they have recently migrated, apparently *en masse*, to another region. This, we gather from a Rangoon paper, is a tract of country on the north-east of Upper Burmah, which belongs neither to the Siamese nor the Burmese, and over which the Chinese have never pretended to exercise any authority. This district is ruled over by a number of Shan and Kachyen chieftains, some of whom were at first inclined to oppose the Panthay settlement, but have ceased to make any opposition to it. The immigrants are said to be nearly 3,000 in number, and are divided into two settlements about ten miles apart. They have intermarried with the women of the country, and in course of time will, no doubt, form a considerable community among these savage tribes. Their principal occupation is agriculture, though a few of them have taken small quantities of goods from Mandalay, and have laid the foundation of a trade with the surrounding tribes. These Panthays, it seems, prefer the rude independence of their colony in the wilds to settling in either Upper or British Burmah.

NOTWITHSTANDING the embarrassed position of Russia at the present time, there seems to be no falling off in the exemplary activity of the Russian Geographical Society; indeed, it is well known that while its researches in Asia are of high scientific value, they are also not without political utility, and perhaps significance. The April meeting, the official abstract report of which is just to hand, was Asiatic all over. It was reported that the expedition to explore the divide between the waters of the Obi and Yenesei had set out on March 12, and that M. Smirnow was to set out on April 15 for the Petchora, to spend the summer in investigating the magnetic elements. The Society has projected two other expeditions for this summer, one of an ethnographical character in European Russia, the other purely geographical to Mongolia. M. Potanin, who had just returned, gave a summary of the results of his explorations in the Altai regions, some details of which we have already given. For the first time we have something like

an adequate account of the extent, the offshoots, the physical geography, and the ethnology of the Altai region. The second part of the third volume of the results of the Siberian expedition of the Society has been published, and contains a study, by Prof. Oswald Heer, of the flora of the jurassic beds of the government of Irkutsk and the region of the Amoor. The eighth volume of the *Memoirs* of the Society, also recently published, ought to interest ethnologists, containing as it does a large collection of information on "customary law" as it exists in various districts of Russia and among some of the tribes on her borders.

THE *Times* Paris correspondent states that according to the German papers Hermann Soyaux, the botanist of the German Expedition to the Loango coast, 1873-76, will set out in July or August on another expedition to equatorial Western Africa to explore the Gabun and Ogovai country in the interests of natural science, and at the same time, under the patronage of the Hamburg firm of Wörmann, to make experiments with a view to the starting of plantations. A long account of Herr Soyaux's travels in Loango and Angola is about to appear, published by Messrs. Brockhaus.

TECHNICAL EDUCATION IN UNIVERSITY COLLEGE, LONDON

IN November, 1876, a short paragraph was inserted in NATURE (vol. xv, p. 69) which contained a notice of the commencement of technical teaching at University College in connection with the classes of mathematics, physics, engineering, and drawing. It may be of interest to state what progress has been made in the workroom up to the present time under rather unfavourable conditions. This we endeavour to do after a recent visit paid at the request of M. Robin, M.Sc., the able and painstaking superintendent of the department, under the direction of the professorial staff. At present the workroom is open on each week-day from ten to five, except on Saturdays, when it is closed at two. The superintendent is present from ten to three on three of the days. Students, who make use of the room, may choose their own hours for work.

Following the order indicated in the syllabus, we first examined the models in the mathematical section. Here we were specially interested in the models illustrative of most of the propositions of modern geometry; pencils of planes and of lines (to show the simple contrivances employed, we may say these models were made of knitting-needles with small spherical ends of sealing-wax of different colours, thus enabling the student to see their different directions; in other cases joins were indicated by ties of differently coloured wool, thus allowing motion to the figures, as in a model showing that the corresponding points of two perspective triangles meet in a line). Projective rows of points made of pricked wood, the corresponding points joined by india-rubber threads; models exhibiting the generation of ruled surfaces of the second order, movable models made of silk threads stretched by weights, parallel pencils of lines making the paraboloid. The generation of curves by the intersection of pencils of lines; this was shown by two flat pencils of lines made of coloured silk in mahogany frames, one of which moved upon the other; at the intersection of certain pairs of threads were placed small indices which clearly showed to the eye various forms of ellipses and hyperbolas. This model we remember attracted considerable attention at the *conversazione* in June last, whilst Prof. Henrici was manipulating it so as to give the curves named. Curves are also produced, whose forms are shown by the aid of sawdust or of sand scattered on a glass plate; these were mostly got as envelopes. In this department, also, are several models of linkages giving approximate and true straight lines, illustrating the dis-